REVISIONS			
SYMBOL	DESCRIPTION	DATE	APPROVAL
---	Released	7 Sept. 1994	RSB

SHEET REVISION STATUS

SH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
REV	--	--	--	--	--	--	--	--	--	--	--									
SH	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
REV																				
SH	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
REV																				

ORIGINATOR K. Kim / UNISYS Ki Ick Kim	DATE 8/26/94	FSC: 5961
APPROVED S. Archer-Davies / UNISYS S Archer-Davies	8/26/94	PROCUREMENT SPECIFICATION FOR DIODE, TEMPERATURE SENSING. (XDT-570)
CODE 738 APPROVAL D. Bergman / GSFC Dal L Bgmn	8/30/94	
CODE 311 APPROVAL J. M. Lohr / GSFC J. M. Lohr	9-2-94	
CODE 311 SUPERVISORY APVL R. L. Chinnapongse / GSFC R. L. Chinnapongse	9/2/94	S-311-P-787

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND 20771

CAGE CODE: 25306

1. **SCOPE**

1.1 Scope. This source control drawing defines the requirements for a cryogenic temperature sensing diode for use in space flight applications.

1.2 Part number. The part number for parts which meet the requirements of this specification shall be G311P787

1.3 Absolute maximum ratings. Stresses above the absolute maximum rating may cause permanent damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.

Reverse Voltage (V_R):	100 V.
Forward Current (I_F):	100 µA.
Soldering temperature:	200 °C.
Storage temperature range:	1.4 K to 475 K.

1.4 Recommended operating conditions.

Operating temperature range 1/:	1.4 K to 380 K.
Forward Current (I_F):	10 µA ± 0.05%.

1/ The sensors shall be calibrated for temperature range of 50 K to 325 K only as specified in Table I herein.

2. **APPLICABLE DOCUMENTS**

2.1 Government specification and standards. The following documents form a part of this drawing to the extent specified herein.

SPECIFICATION

MILITARY

MIL-S-19500 Semiconductor Devices, General Specification for

STANDARDS

MILITARY

MIL-STD-750 Test Methods for Semiconductor Devices

MIL-STD-883 Test Methods and Procedures for Microelectronics

2.2 Order of precedence. In the event of a conflict between this drawing and the applicable documents cited herein, the order of precedence shall be this drawing, MIL-S-19500, and the remaining applicable documents.

3. **REQUIREMENTS**

3.1 General. The devices procured to this specification shall be compliant to the requirements of MIL-S-19500, JANTXV level to the degree specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-S-19500, JANTXV and herein.

3.2.1 Case outline. The case outline shall be in accordance with figure 1. Both leads shall be electrically isolated from any of the mounting surfaces of the device case.

3.2.2 Lead Finish. The lead finish shall be gold plated Kovar.

3.3 Electrical performance specifications. Unless otherwise specified herein, the electrical performance characteristics are as specified in Table I.

3.4 Electrical test requirements. The electrical test requirements shall be as specified in Table I.

3.5 Product assurance requirements. Delivered devices shall be those which have been subjected to and have passed the applicable requirements, tests, and inspections detailed in MIL-S-19500 and herein.

3.5.1 General. Devices furnished under this specification shall be devices which are designed and fabricated at an approved facility as required herein.

3.5.1.1 Certification and qualification. The device manufacturer shall be certified and qualified to produce Semiconductor devices compliant to MIL-S-19500 for JANTXV level. The procuring activity may perform an audit to determine capability of a manufacturer in lieu of the manufacturer being listed on the QPL-19500.

3.5.1.2 Screening. All devices delivered to this specification shall have been subjected to and have passed the screening in accordance with Table II herein.

3.5.1.3 Quality conformance inspection (QCI). All devices delivered to this specification shall have been subjected to and have passed the QCI as specified in section 4 herein.

3.5.1.4 Traceability. Traceability shall be in accordance with MIL-S-19500, JANTXV level.

3.5.1.5 Procuring activity source inspections. The procuring activity reserves the right to perform the inspections listed below, at the manufacturer's facility. The procuring activity shall be notified of the place, date and time for any required customer source inspections in 14 working days in advance, as a minimum.

3.5.1.5.1 Precap visual inspection. Only production lots which have passed the requirements of MIL-STD-750, method 2072 performed by the manufacturer shall be presented to the procuring activity for inspection. The procuring activity reserves the right to use their own equipment, at the manufacturer's facility.

3.5.1.5.2 Final electrical test. The procuring activity shall reserve the right to witness the performance of final electrical testing at the conclusion of burn-in.

3.6 Marking. Each device shall be marked as following:

a. Part number from paragraph 1.2 herein.
b. Manufacturer's name, logo or cage code.
c. Lot date code.
d. Electrostatic Discharge Sensitivity Identifier, per MIL-S-19500.
e. Serial Number.

If device size precludes above marking requirements on the individual part, all of the marking shall be placed on the individual package for each part except that the last three (3) digits of the serial number must be placed on the individual devices.

3.7 Certificate of compliance. A certificate of compliance shall be submitted with the delivered parts and shall state that the manufacturer's product meets the requirements of MIL-S-19500 to the degree specified herein, and the requirements herein.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in this specification or the purchase order, the manufacturer is responsible for performing all inspections specified herein using their own facilities or an outside laboratory acceptable to the procuring activity. Upon receipt of product, the procuring activity reserves the right to perform any of the inspections set forth in this specification.

4.2 Sampling and inspection. Sampling and inspection procedures shall be as specified in Tables II and III herein.

4.3 Screening. Screening shall be in accordance with Table II herein. The following additional criteria shall apply:

a. Interim and final electrical test parameters shall be as specified in Table I herein.

4.4 Quality conformance inspection. Quality conformance inspection shall consist of the group B inspection specified in Table III herein, with the following additional criteria:

a. End-point electrical parameters shall be as specified in Table I herein.

b. Unless otherwise noted, the samples for group B inspection shall be selected from units that have been subjected and have passed the screening of paragraph 4.3 herein.

5. PACKAGING

5.1 Packaging requirements. The requirements shall be in accordance with MIL-S-19500.

5.2 Unit package identification and marking. The unit package shall be marked with the following:

a. NASA/GSFC H4 identification number (Cage Code)(25306).

b. Device part number per 1.2.

c. Manufacturer's name and H4 code identification number (Cage Code).

d. Date code in accordance with MIL-STD-1285.

e. Inspection lot number.

f. ESD sensitivity warning symbol.

g. Quantity in container

h. Purchase order number.

5.3 Group B devices. Group B devices shall be packaged separately from deliverable devices, marked as such and shall be delivered.

5.4 Shipping container. The devices shall be packaged and delivered in ESD protective containers. The shipping container shall be legibly marked with the following information.

a. Purchase order number.

b. Device part number.

c. Manufacturer's name and H4 identification number (Cage Code).

5.5 Deliverable data package. The data package for each shipment shall include the following:

a. Cover sheet with traceability information and serial number range.

b. Certificate of conformance.

c. Copies of actual processing and screening travelers.

d. Calibration certificate and interpolation table in a 5 1/4" diskette for each sensor.

e. Radiography report and film.

f. Screening attributes data.

g. Burn-in variables and attributes data reported by device serial number.

h. Burn-in delta variables data.

i. Waivers, if any.

j. Group B variables and attributes data.

6. **NOTES**

6.1 Notice. When GSFC drawings, specifications, or other data are sent for any purpose other than in connection with a definitely related GSFC procurement operation, the United States government thereby incurs no responsibility nor any obligation whatsoever. The fact that GSFC may have formulated, furnished, or in any way supplied said drawings, specifications or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any persons or corporations or conveying any rights or permission to manufacture, use, or sell any patented invention that may be in any way related thereto.

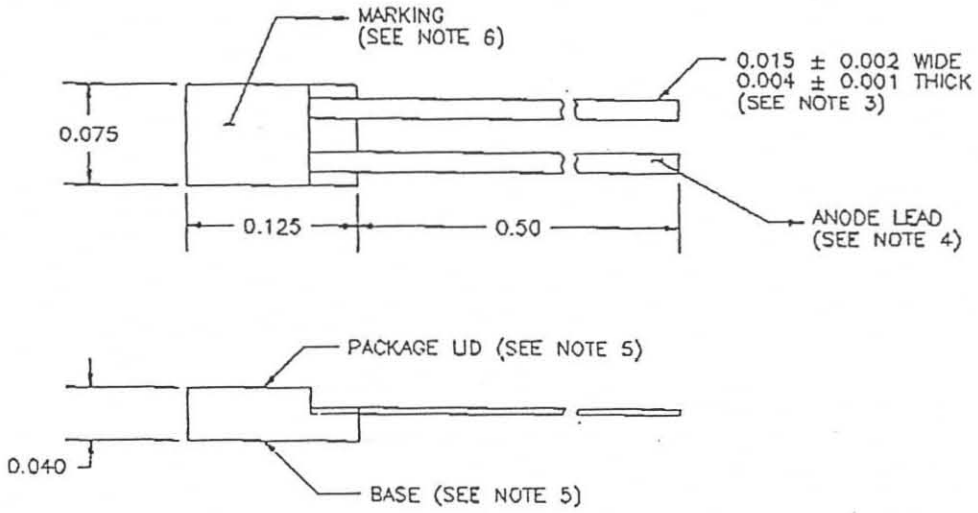
6.2 Qualifying activity. The identification and contact address of the qualifying activity shall be as follows:

Custodian
Goddard Space Flight Center
Greenbelt, Maryland 20771

ATTN. QPL Administrator
Code 311.2

6.3 Approved Source.

Lake Shore Cryogenics, Inc
64 East Walnut Street
Westerville, Ohio 43081-2399



NOTES:

1. DIMENSIONS IN INCHES
2. TOLERANCES X.XXX = ±0.010
3. LEAD MATERIAL: GOLD PLATED KOVAR
4. ANODE LEAD IS IDENTIFIED AS THE LEAD ON THE LEFT WITH PACKAGE LID UP AND LEADS TOWARD USERS (OBSERVER).
5. CONSTRUCTION MATERIAL – SAPPHIRE BASE WITH ALUMINA BODY AND LID. GOLD PLATED MOLYBDENUM/MANGANESE METALIZATION SYSTEM WITH NICKEL UNDERPLATE.
6. LAST THREE DIGITS OF THE SERIAL NUMBER SHALL APPEAR ON THIS SURFACE SEE PARA 3.6 "MARKING".

Figure 1. Case Outline

Table I. Electrical Characteristics

PARAMETER	Symbol	CONDITION	MIN	TYP	MAX	UNITS
Nominal Forward Voltage (Note 1)	V_F	I_F = 10 μA, T_A = 4.2 K T_A = 295 K		2.4 0.4		V
Sensitivity		I_F = 10 μA, T_A = 4.2 K T_A = 295 K	50 2.75			mV/K
Equivalent Noise Voltage (Note 2)	e_N	I_F = 10 μA, T_A = 4.2 K DC to 1 Hz			100	μVp-p
Accuracy		I_F = 10 μA, T_A = 50 to 90 K T_A = 90 to 325 K	-0.05 -0.1	±0.03 ±0.025	+0.05 +0.1	K
Power Dissipation	P_D	I_F = 10 μA, T_A = 4.2 K			25	μW

1/ The supplier shall provide, in ASCII format on 5 1/4" diskettes, an interpolation table, for each device supplied, of the VF at the following calibration temperature points:

Temperature Range	Data Points
50 K to 90 K	at 0.01 K increments
90 K to 180 K	at 0.1 K increments.
180 K to 325 K	at 1.0 K increments.

The measurements shall at every interim electrical steps required by table II and III, and shall be repeatable with maximum error of 50mK.

2/ This parameter shall be guaranteed by the supplier. However, the supplier need not test individual devices for this parameter.

Table II. Screening Requirements

Inspection/Test	MIL-STD-750	
	Methods	Conditions
1. Internal Visual (Precap)	2072	
2. Temperature Cycling	1051	20 Cycles, 77K to 325K, Time at each extreme temperature shall be 3 minutes, minimum. Time between the extreme temperature shall be 20 minutes, maximum.
3. Serialization		
4. Radiography	2076	two views
5. Hermetic Seal a. Fine Leak b. Gross Leak	1071	 Cond. G. Cond. C.
6. Constant Acceleration	2006	force = 5,000G, Y_1 Orientation Only
7. PIND	2052	Cond. A.
8. Initial Electrical Measurements		per Table I herein
9. Burn-In	1038	Cond. B, T_A = +100 °C Min, I_F = 10 µA ± 0.5 µA, for 168 hours
10. Final Electrical Measurements		per Table I herein.
11. External Visual	2071	3 to 10X

Table III. Group B Inspection

Inspection/Test	MIL-STD-750		
	Methods	Conditions	Sample Size
Subgroup 1			
Solderability 1/	2026	Cond. A	4(0)
Subgroup 2			
Steady State Life test	1038	Cond. B, T_A = +100 °C, I_F = 10 µA ± 0.5 µA, for 1,000 hours	12(0)
Electrical Measurements		per Table I and II herein	
Bond Strength 2/	2037	Cond. A all wires.	12(0)
Die Shear 2/	2017		4(0)

1/ Samples may be selected from electrical rejects or unscreened units.

2/ These tests may be, at the supplier's option, performed during the manufacturing as an In-Production test provided that the wire bonding and die attach processes are identical to processes employed for the actual parts. Also, the die shear test may be performed on a flat test substrate which has identical material and metallization as the actual substrate used, using the identical die attach process, provided that the dice mounted on the test substrates are subjected to the temperature cycling and the constant acceleration test as described in Table II herein.